

**INCREASING HYDROGEN ADSORPTION OF NANOSTRUCTURED  
STORAGE MATERIALS BY MODIFYING  $sp^2$  COVALENT BONDS**

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**ABSTRACT**

According to the invention, nanostructured storage materials are provided for storing hydrogen. The nanostructured storage materials can include a network of light elements, such as Be, B, C, N, O, F, Mg, P, S, and Cl, coupled with  $sp^2$  bonds. The hydrogen adsorption to the nanostructured storage material is improved by modifying the  $sp^2$  bonds. The  $sp^2$  bonds can be modified by forming the nanostructured storage material from the above light elements, possibly with a shape other than a planar layer, and by introducing defects. A chemical vapor deposition technique can be used for the synthesis, where doping gases are included into the flow. Methods for forming the nanostructured storage material with defects include removing light elements from the nanostructured storage material by irradiation with electrons, neutrons, ions, gamma rays, X-rays, and microwaves.